

It is, therefore, the purpose of this paper to suggest that the De Luna Expedition might well have furnished the impetus that resulted in the adoption in the southeast of various Mexican art styles and concepts. An intensive and considerable amount of research, however, is needed to analyze and compare the various representations in the Southeast and to examine the Mexican records to see the degree of resemblance to the culture of the area from which the De Luna Expedition in 1559 obtained their Indians.

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PALEONTOLOGY.—*A new fossil comatulid from the Cretaceous of Cundinamarca, Colombia*.¹ AUSTIN H. CLARK, U. S. National Museum.

Dr. José Royo y Gómez, geologist of the Ministerio de Minas y Petroleos, Bogotá, Colombia, with the consent of the Ministry and of Brother Apolinar María, director of the Museo del Instituto La Salle, has kindly submitted to me for study two unusually interesting specimens of a fossil comatulid from the Cretaceous of Colombia. These are the first comatulids to be reported from the Cretaceous in any area outside of Europe. The specimens are unusually complete, with cirri, division series, arms, and fragmentary pinnules; but they do not show the centrodorsal clearly, and the articular faces of the radials are not visible at all. They represent a remarkable new species quite different from any heretofore known, neces-

sitating the creation of a new genus. This new genus finds its closest association with the family Palaeantedonidae, known from the Upper Cretaceous to Quaternary in England, France, Belgium, Holland, Denmark, southern Sweden, northern Germany, Austria, Hungary, Italy, Algeria, and possibly Sinai, Java, and South Carolina.

Some of the species belonging to certain genera of the family Palaeantedonidae might equally well be referred to the recent family Antedonidae, as for instance certain species of *Palaeantedon*. The specimens under consideration, however, although showing many features which would permit their reference to this family, present others, especially the uniformly short pinnule segments and the strong beaded ornamentation

¹ Received April 3, 1944.

of the distal edges of the brachials, that suggest a rather remote relationship to this group.

I am deeply appreciative of the courtesy and generosity of Dr. Royo and of Brother Apolinar María in affording me the opportunity of studying and reporting upon these most interesting specimens. In honor of Dr. Royo I take pleasure in designating the new genus represented by the name of—

Roiometra, n. gen.

Diagnosis.—A genus of the family Palaeantedonidae including large species (with the centrodorsal 12 mm in diameter) with very numerous (over 100 [C]) very slender cirri composed of elongate proximal and short smooth distal segments; 10 arms composed of short oblong, or nearly oblong, brachials, which have the distal edges ornamented with a row of conspicuous beadlike tubercles; the IBr series 2; and flexible pinnules composed of segments which are not longer than broad.

Genotype.—*Roiometra columbiana*, n. sp.

Occurrence.—Cretaceous of Cundinamarca, Colombia.

Roiometra columbiana, n. sp.

Description.—The surface of the centrodorsal is nowhere visible, but from the pattern of the basal segments of the cirri still adhering the centrodorsal appears to be hemispherical or subconical, about 12 mm broad at the base and about 10 mm high. The pattern of the basal cirrus segments indicates that the cirrus sockets are arranged in very numerous closely crowded alternating rows which, from the rim to the dorsal pole, are probably between 12 and 15, or possibly more, in number. From the small size of the basal cirrus segments it is apparent that the cirrus sockets are very small. The indications are that the bare dorsal pole is very small.

The cirri are exceedingly numerous and very slender, appearing somewhat like a tuft of coarse hair. They are probably well over 100 (C) in number. Most of them appear to be about 27 mm in length, with the longest peripheral cirri about 34 mm and the cirri near the dorsal pole much shorter; the width is from 0.5 to 0.7 mm. They are composed of probably 25–30 segments. In the longest cirri the longest earlier segments are between 3 and 4 times as long as broad, slightly constricted centrally and

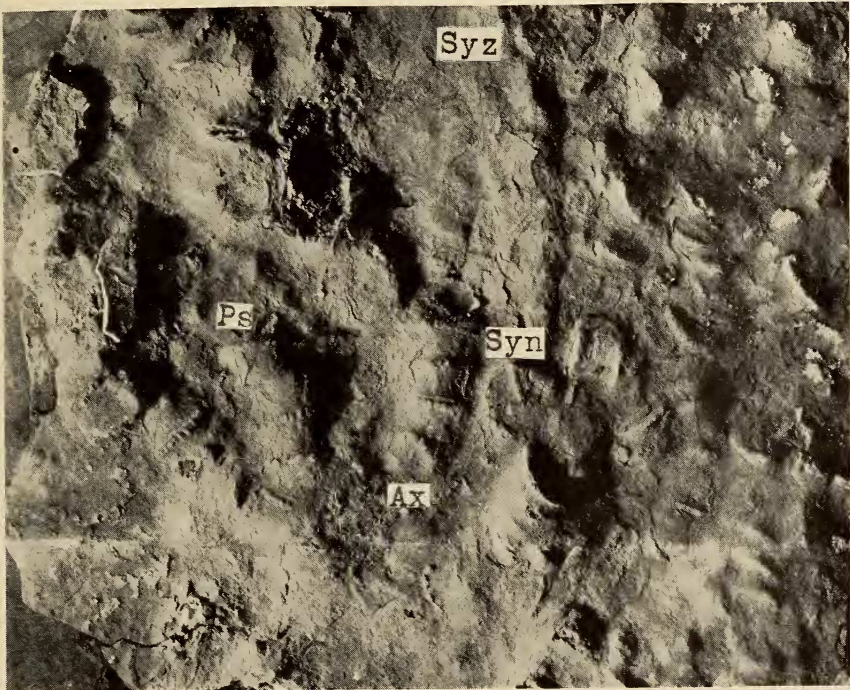
slightly flaring distally, and the outer segments are from about as long as broad to half again as long as broad with slightly broadened distal ends. The terminal portion of the cirri appears to taper to a point. There are no indications of dorsal or of opposing spines.

The division series and a considerable portion of the arm bases are concealed by the dense mass of cirri. The arms seem to have been 10 in number. They are about 5 mm in diameter, and as far as they are preserved, in one case for 80 mm beyond the cirri, they do not taper. The brachials appear to be between 3 and 4 times as broad as long; the earlier have the ends somewhat oblique, the later have them parallel or nearly so. The distal ends of the earlier brachials are somewhat produced, and from their appearance were either tubercular or spiny. There is no definite evidence of syzygies.

There are many scattered pinnule segments in the matrix between the arms, but most of them are indefinite. They are mostly grouped in short series. From the way in which most of these series are curved it is evident that the pinnules were flexible. Some series of pinnule segments lie across the arms where they simulate a beadlike ornamentation of the brachials. The pinnule segments are all short, none of them being longer than broad. On what appear to be the earlier segments the outer end is produced on the distal side into a high spine. The outer pinnule segments taper proximally to a narrow base.

On the reverse side of the slab, beneath the specimen on the right, a IBr series is visible. The IBr₁ is about 2.5 mm long, and about half again as broad as long; the proximal and distal edges are rather strongly everted and thickened. The IBr₂ (axillary) is about 3.5 mm in length, broader than long, pentagonal, with the lateral borders about two-thirds as long as those of the IBr₁ and making a broadly obtuse angle with them, and the distal edges almost straight and ornamented with a row of 6 or 7 prominent rounded tubercles; the anterior angle measures about 90°.

The first brachial is wedge-shaped, about half again as long exteriorly as interiorly, and about as broad as long in the median line. The distal edge is bordered with a row of tubercles resembling those on the distal edges of the axillaries. The second brachial is less obliquely wedge-shaped, almost oblong though slightly



ROIOMETRA COLUMBIANA, n. sp.

Upper: Two specimens, natural size. *Lower:* Portion of reverse side of slab, beneath the right hand specimen shown above, $\times 2$. Ax = IBr axillary; Ps = pinnule segments; Syn = synarthry; Syz = syzygy. Objects referred to are to the right of the letters, except the synarthry, which is below.

longer exteriorly than interiorly, slightly larger than the first brachial, with the surface slightly concave and the distal border everted and ornamented with a row of about 10 tubercles. As is shown on another arm, the first two brachials are united by synarthry. The third and fourth brachials are united by syzygy, forming a syzygial pair which is somewhat longer than broad; the fourth brachial (epizygal) has the distal edge everted and bordered with a row of tubercles; the distal edge of the third brachial (hypozygal) is unmodified. The right arm is broken off at the distal end of the first syzygial pair. On the left arm the fifth brachial is wedge-shaped, about twice as long exteriorly as interiorly, and short, about three times as broad as the median length. The sixth brachial is similar, but the long and short sides are reversed.

The underside of the slab is almost entirely covered with brachials, mostly in more or less long series, but many as individuals or in small groups. Nearly all these are much worn and so the details can not be made out, though a few are in fairly good condition. Most of the brachials are from 4 to 4.5 mm in diameter, and the outline of the dorsal half is a regular semicircle. The distal edge is everted and somewhat produced, and in the best preserved brachials is tubercular. From the ends of the transverse ridge through which the central canal passes the sides of the brachials converge ventrally in two straight lines making with each other an angle of about 70° to a rather sharply rounded apex; these two converging straight lines are the outer edges of the muscular fossae. Some of the brachials show syzygial faces. These are perfectly developed, with apparently 16-18 radiating ridges.

Together with the brachials there are many pinnule segments, mostly in short series of various lengths, though many are isolated. Some few of these are still in close proximity to the brachials to which originally they were attached. All these pinnule segments are so worn that little can be said about them further than that they are somewhat broader than long, or at least not longer than broad, with more or less constricted proximal ends. A first pinnule segment still attached to a brachial is subtriangular with the apex, adjacent to the brachial, very broadly rounded, slightly broader than long, with a straight distal edge. The pinnule

segments are evenly rounded dorsally, and the distal border is usually more or less strongly produced.

Type.—From Naranjillo, Municipio de La Vega, Departamento de Cundinamarca, Colombia; in the Museo del Instituto de La Salle, Bogotá, República de Colombia. From the Middle Villeta formation of the middle Albian, or about middle Cretaceous.

Remarks.—A considerable number of fossil comatulids have been recorded from the Cretaceous of England, Europe, and north Africa. Quite unidentifiable are: *Comatula* sp. Étallon, 1857 (France); *Antedon* sp. Downes, 1880, 1882 (England); *Antedon* sp. Stolley, 1891 (Schleswig Holstein); *Antedon* sp. Jahn, 1895 (Bohemia); *Antedon* sp. Hennig, 1899 (Sweden); and *Eudiocrinus* sp. Brünnich-Nielsen, 1913 (Denmark). Species known only from brachials are: *Antedon granulata* Brünnich-Nielsen, 1913 (Denmark); and *Antedon stevensi* Brünnich-Nielsen, 1913 (Denmark). A species of which the arms are known but the calyx ossicles are only imperfectly described is: *Pachyantedon beyrichi* Jaekel, 1891 (north Germany).

Species in which only the centrodorsal is known are all referred to the genus *Glenotremites* Goldfuss, since their true systematic position cannot be determined. These are: *Glenotremites adregularis* Gislén, 1925 (England); *G. alternata* Gislén, 1925 (England); *G. angelini* Gislén, 1924 (south Sweden); *G. arnaudi* de Loriol, 1894 (south France); *G. batheri* Gislén, 1924 (England); *G. concavus* Schlüter, 1878 (Holland); *G. discoidalis* Gislén, 1925 (Bohemia; Belgium); *G. essenensis* Schlüter, 1878 (west Germany); *G. e.* var. *tuberculatus* Gislén, 1925 (England); *G. excavatus* Gislén, 1925 (England); *G. exilis* de Loriol, 1869 (Switzerland); *G. faxensis* Brünnich-Nielsen, 1913 (Denmark); *G. intermedius* Gislén, 1925 (England); *G. janeti* Valette 1917 (France); *G. laticirrus* P. H. Carpenter, 1880 (England); *G. lettensis* Schlüter, 1878 (west Germany); *G. lundgreni* P. H. Carpenter, 1880 (England); *G. minutissimus* Valette, 1917 (France); *G. paradoxus* Goldfuss, 1831 (north and west Germany; Belgium, England); *G. parvicavus* Gislén, 1924 (Denmark); *G. parvistellatus* Gislén, 1925 (England); *G. parvus* Gislén, 1925 (England); *G. perforatus* P. H. Carpenter, 1880 (England); *G. pusillus* Fritsch, 1910 (Bohemia); *G. pyropa* Zahalka, 1892 (Bohemia);

G. rosaceus Geinitz, 1871 (Bohemia; ?Saxony); *G. rotundus* P. H. Carpenter, 1880 (England); *G. rogosus* P. H. Carpenter, 1880 (England); *G. schlueterianus* Geinitz, 1871 (Saxony); *G. scutatus* Gislén, 1925 (north Germany); *G. semiglobularis* Brünnich-Nielsen, 1913 (Denmark); *G. striatus* P. H. Carpenter, 1880 (England); *G. sulcatus* Schlüter, 1878 (south Sweden); *G. tourtia* Schlüter, 1878 (west Germany); and *G. valetti* Gislén, 1924 (France; England).

Specimens in which at least the centrodorsal and the basal and radial rings are preserved are capable of more exact systematic allocation. As determined by Prof. Torsten Gislén these fall in the following families and genera: Family COMASTERIDAE: *Palaeocomaster lovénii* P. H. Carpenter, 1880 (England). Family SOLANOCRINIDAE: *Solanocrinus almerai* de Loriol, 1900 (Spain); *S. campichei* de Loriol, 1879 (Switzerland); *S. gevreyi* de Loriol, 1902 (France); *S. gillieronii* de Loriol, 1879 (Switzerland); *S. hiselyi* de Loriol, 1869 (Switzerland); *S. humilis* Gislén, 1924 (France); *S. infracretaceus* Ooster, 1871 (Switzerland); *S. leenhardti* de Loriol, 1908 (France); *S. picteti* de Loriol, 1879 (Switzerland); *S. rikordeanus* d'Orbigny, 1850 (France); *S. vagnacensis* de Loriol, 1888 (France); and *S. valdensis* de Loriol, 1868 (Switzerland). Family CONOMETRIDAE: *Amphorometra alta* Gislén, 1925 (England); *A. brydonei* Gislén, 1924 (England); *A. conoidea* Goldfuss, 1839 (north Germany; Holland); *A. c.* var. *laevis* Gislén, 1924; *A. c.* var. *granulata* Gislén, 1924; *Placometra mortenseni* Gislén, 1924 (England); *Jaekelometra belgica* Jaekel, 1901 (Holland); *J. columnaris* Gislén, 1924 (Holland); and *Conometra rugiana* Gislén, 1924 (north Germany). Family NOTOCRINIDAE: *Loriolometra retzii* Lundgren, 1874 (Sweden); *Sphaerometra aequimarginata* P. H. Carpenter, 1880 (England); *S. carentonensis* de Loriol, 1894 (France); *S. incurva* P. H. Carpenter, 1880 (England); *S. semiglobosa* Schlüter, 1878 (Germany); *S. senonica* Gislén, 1925 (England); and *S. teteni* Wegner, 1911 (Germany). Family PALAEANTEDONIDAE: *Semiometra bohémica* Gislén, 1925 (Bohemia); *S. courvillensis* Valette, 1917 (France); *S. impressa* P. H. Carpenter 1881 (Sweden); *S. lenticularis* Schlüter 1878 (Holland); *S. minuta* Gislén (England); *S. plana* Brünnich-Nielsen, 1913 (north Germany; Denmark); *S. plana* var. *stellata* Gislén, 1925

(England); *S. pommerania* Gislén, 1924 (north Germany); *S. rowei* Gislén, 1924 (England); *S. scania* Gislén, 1924 (Sweden); *Hertha cava* Brünnich-Nielsen, 1913 (Denmark); *H. mystica* Hagenow, 1840 (north Germany; Belgium); *H. pygmaea* Gislén, 1924 (north Germany); *H. suecica* Gislén, 1924 (Sweden); and *Palaeantedon danica* Brünnich-Nielsen, 1913 (Denmark).

Four additional species have not as yet been assigned to the genera now used; these are: *Actinometra batallieri* Astre, 1925 (Spain); *Antedon astellatus* Lehner, 1937 (Germany); *A. bellilensis* Valette, 1935 (north Africa); and *A. chateleti* Valette, 1933 (France).

In determining the systematic relationships of this new species the unidentifiable fragments and the species based upon brachials or arms may be disregarded. It is necessary, however, to consider the numerous species represented only by centrodorsals—assembled under the generic term *Glenotremites*. These species are divisible into two groups. In the first group the centrodorsal is columnar to conical, more rarely discoidal, and the cirrus sockets are large and prominent and arranged in columns, or if they are in a single row they show a distinct transverse ridge. Evidently this new species can not belong here. In the second group the centrodorsal is discoidal to hemispherical and the cirrus sockets are in crowded alternating rows, or if they are in a single row they are without sculpture. The new species is not closely related to any of the described species in this group.

The species in which at least the centrodorsal and the basal and radial circlets are preserved are distributed among the families Comasteridae, Solanocrinidae, Conometridae, Notoocrinidae, and Palaeantedonidae. The new species can not belong to the family Comasteridae, in which the centrodorsal is much flattened with the sides never divided into radial areas, and the cirrus sockets are large or absent. It can not belong to the family Solanocrinidae, in which the centrodorsal is discoidal to columnar with the sides never divided into radial areas, and the cirrus sockets are large and arranged in columns or in a single row. It can not belong to the family Notoocrinidae, in which the centrodorsal is conical to hemispherical with the sides not divided into radial areas, and the cirrus sockets are large. Finally, it can not belong to the family Conometridae, in the known species of